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ABSTRACT

This booklet consists of six sample lessons integrating population education into science instruction. It is one of four in a series. Materials differ from those in an earlier series (1980) in that lessons are presented at the secondary level only; there is no duplication of lessons from the earlier series in terms of content and teaching strategies. Using an experimental approach, the main theme running through most of the lessons is that a pleasant and liveable environment is a result of a balanced and symbiotic relationship among plants, animals, and other living resources which help maintain a good ecology. Lesson topics include plant and animal population dynamics, the influence of man on plants and animals, the biosphere, communities and ecosystems, malnutrition and undernutrition, and diseases caused by malnutrition. Each lesson contains a box which provides the user with initial information on content, objectives, grade level, and subject into which population education should be integrated. Although the main body of each lesson varies, most lessons contain an explanation of content, teaching-learning strategies, and in some cases, evaluation suggestions. Lessons were adapted from materials derived from India, the Philippines, and Sri Lanka. (LH)

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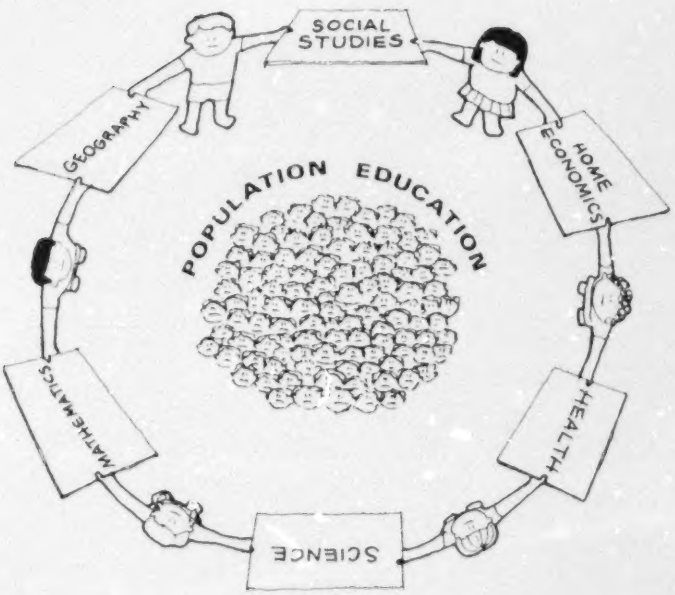
population education in SCIENCE

some sample lessons for the secondary level



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BKP/84/OPE/350–2500

POPULATION EDUCATION IN SCIENCE

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INTRODUCTION

This booklet consisting of sample lessons integrating population education into science, is one of the four in a series prepared to provide more innovative lessons in addition to the six booklets developed and disseminated in 1980. First conceived to provide teachers, educators and curriculum developers with useful tools for disseminating population education concepts in the school setting, the first six booklets consisted of sample lessons integrating population education concepts into social studies, health, mathematics, science, home economics and geography which are taught at the primary and secondary levels. While the 1980 booklets contained lessons for use at both primary and secondary levels, the present set of four booklets consists of sample lessons introducing population concepts into selected subjects (social studies, science, mathematics, and home economics) for use at the *secondary level* only. The main reason for this focus is that more and more countries in Asia are introducing population education at the secondary rather than the primary level. Many of them, whether they have new or on-going population education programmes have developed a wider range of lessons and learning materials for secondary courses - many of which are in their respective national languages.

Compared with the past, more and more population education programmes are at present paying closer attention and devoting more time to the development of curriculum materials in population education. Integrating population education concepts into various subject areas is not as easy as it might seem. Although a number of content analyses of school textbooks have shown that population education concepts already exist in these materials, they are more there by accident than by design. Some programmes on the other hand go to the other extreme. In their case, too many population education concepts are introduced into the subjects, overburdening the curriculum material and thus overwhelming the teacher with extra teaching load. This naturally results in the rejection of the population education concepts and gives little chance for their acceptance as a built-in enrichment area for the total general curriculum programme.

Thus the primary objective of this series of curriculum materials is to provide a continuous stream of exemplary lessons and learning materials showing the various techniques and strategies that different countries have taken to integrate population education into various subjects taught in the school. Hopefully, a regular updating of these booklets will show a trend in the efforts of the countries to finally adapt a strategy that will ensure a proper integration of these concepts, not in a skeletal and

unsystematic manner nor in an overwhelming and saturating sense either, but in an adequate quantum that will meet the acceptable minimum learning requirements called for in this field.

Organization of this booklet

'Population Education in Science' consists of six sample lessons integrating population education into science. The sample lessons included in this booklet are a combination of original materials and an adaptation of lessons derived from India, the Philippines and Sri Lanka. The selection of sample lessons is first of all based on the criterion that they should not duplicate those found in the 1980 booklets in terms of content and treatment or teaching strategy. Secondly, they should offer new techniques in the development of population education concepts. In cases where the lessons contained good and appropriate concepts but the development and treatment was not carefully executed, considerable adaptations have been made.

Each lesson contains a box which provides the user with initial information with regard to content, objectives, grade level and subject into which it should be integrated. The main body of each lesson varies. For example, at its simplest form, some lessons contain a straight narrative exposition of the content and some evaluation questions at the end. The second type consists of lessons which carry an overview, content, teaching-learning strategies and evaluation but are given in an outline form, enumerating a list of alternative contents, teaching-learning strategies and assessment questions. The more detailed type of sample lessons contain: (a) an overview or introduction; (b) a suggested teaching materials and references, concretely showing how these teaching aids can be used; (c) the development of the concepts which give specific step-by-step procedures to the teacher on how to expand on the subject, what alternative activities to undertake to achieve these objectives, what reactions to expect from the students and alternative ways of dealing with these reactions; (d) a summary of what has been learned in the lesson; and finally (e) a complete set of evaluation questions to determine the students' gain in knowledge and change in attitude and skills.

Content

The biosphere, the ecosystem, and reproduction in plants and animals are good entry points in science where population education concepts can find relevance. There are six lessons included in this subject area mostly using an experimental approach in their teaching strategies. The main theme running through most of the lessons is that a pleasant and livable environment is a result of a balanced and symbiotic relationship among plants,

animals and other living things and resources which help maintain a good ecology. However, due to over-population, man has destroyed this ideal balance, endangering the quality of life.

Contribution from the member states

There are many more examples of population education lessons which had not been included in this booklet for the simple reason that they come in the countries' national languages. Hopefully, these few lessons should generate more contributions from the member states by providing us with translated lessons which they think can be of great use to other countries.

CONTENT	:	PLANT AND ANIMAL POPULATION DYNAMICS
OBJECTIVES	:	*1. To identify some factors limiting populations;* *2. To determine the density and frequency of two selected plants in a selected simple community and explain possible causes of such density and frequency.*
GRADE LEVEL:		HIGH SCHOOL (SECOND YEAR)
SUBJECT	:	SCIENCE

A. Suggested Activities

Exercise I: Factors Limiting Populations

1. Introduction

Lemna,[1] commonly called duckweed, is a minute floating hydrophyte with flattened or sometimes spherical body form and is usually found on the surface of fresh or inland waters. It is easy to culture and has a relatively short generation time. It reproduces by the budding of small fronds which become independent. Frond counts could be done as a measure of population number.

2. Purpose

Compare the population growth of Lemna under high and low-light intensity.

3. Materials

Lemna - 10-20 plants (i.e., 10 pairs to 20 pairs fronds); 2 equal-sized culture dishes (small plastic basins or bowls) or aquaria; pond water from which the Lemna is taken.

---

1. Yeast or bread mould can also be used.

If chemicals are available, nutrient solution (Hoagland's solution, Bonner, 1952) may be prepared as follows:

HK_2PO_4	-	0.14 gms/litre
KNO_3	-	0.51 gms/litre
$Ca\ (NO_3)_2$	-	1.18 gms/litre
$MgSO_4$	-	0.49 gms/litre

0.5 per cent solution of ferric tartrate

2 electric light bulbs (5 watts; 50 watts)

If there is no electricity, shade or indoor and direct sunlight or outdoors should be substituted for the 5 watt and 50 watt bulbs, respectively.

4. Procedure

Divide the class into groups. The following should be the activity of the group: prepare two culture dishes (small plastic basins or bowls) or aquaria with enough pond water (or nutrient solutions, if available). If using pond water, see that the water is free from small snails or other small animals that may feed on the Lemna. Count and put into each of the culture dishes 10 to 20 Lemna (20 to 40 fronds). If electricity is used as a source of light, use a darkroom and place the bulbs high enough so as not to overheat the culture dishes. To protect the culture solution from direct heat put a transparent dish with water on top of the culture containers. Subject one culture dish under high-light intensity (50 watt bulb) and the other under low-light intensity (5 watt bulb) continuously for the five day duration of the experiment. Observe and count the number of fronds in each container daily. Record daily changes in the growth of the population in each culture. Add pond water (or distilled water, if using nutrient solution) when there is a decrease from the original level of water.

In the absence of electricity, place the culture dish supposed to be under high-light intensity outside or under direct sunlight while the one supposed to be under low-light intensity may be placed indoors, or in the shade. In this case, source of light is not continuous because it depends on daylight.

Compile data gathered.

5. Alternate activities

The students may try similar experiments involving other factors that may affect the growth of Lemna. For example, nutrient solution vs. tap or pond water; small vs. large space; presence or absence of other species (algae) in the same container; presence or absence of small snails; etc.

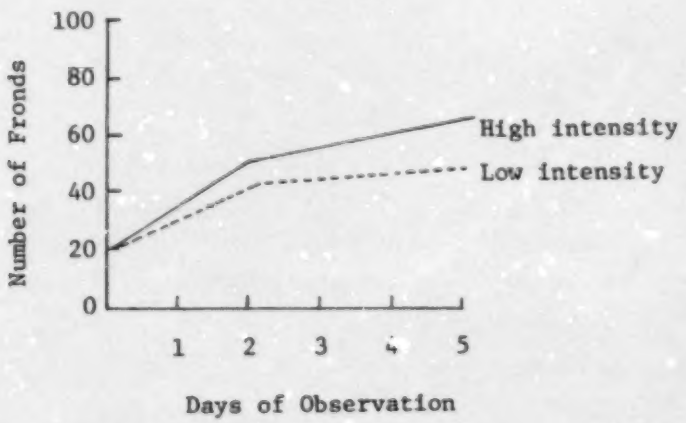
6. Studying the data

a) Organize data into a table similar to the following:

Table I: Number and increase of Lemna in each of the cultures exposed to low- and high-light intensities

Day of Observation	Number of Lemna exposed to		Daily growth increase	
	Low intensity	High intensity	Low intensity	High intensity
1				
2				
3				
4				
5				

Graph the difference in the growth (increase of the Lemna population) in each of the cultures exposed to low- and high-light intensities. (The lines on the graph are hypothetical examples only for the teacher's guidance.)



b) What is the effect of low-/high-light intensity on the number of Lemna? On its growth? When is population growth faster? Slower? Why? What is the effect of light on the population size of the Lemna?

7. Conclusions

a) Can you consider the intensity of light as a factor in determining the population size of Lemna?

b) What other factors may affect the population size of Lemna?

c) Mention other instances in nature wherein factors in the environment may limit population size of certain species of plants.

Exercise II: The Study of a Biotic Community

1. Introduction

The study of a biotic community necessitates the study of the populations of species in that particular community including population characteristics. It is not only important to know the different species in a community, where and how they live but also how they are distributed, how they affect each other, and the relative sizes of their respective populations.

Man is a member of the biotic community. The extent of his influence on other populations is inferred in the exercise.

2. Purpose

Determine the density and frequency of two selected plants in a selected simple community (the second lawn may do) and explain possible causes of such density and frequency.

3. Materials and equipment for each group

a) Plastic clothes line (preferably) or rope or twine 12 m. long, marked off at 0.5 m. intervals - 1

b) Wooden right triangle, (6 x 8 x 10 decimetres) - 1

c) Wooden stages - 8

d) Hammer or mallet - 1

4. Specific procedure

Have the class determine a definite area in the school lawn or athletic field or a vacant lot for study. Using the quadrat method have them select 5 to 10 quadrats. Divide the quadrats among the groups in the class and assign each group to work on those particular quadrats.

In each quadrat, the number of individual plants for each of the two plants under study should be counted. This activity may be done immediately after the experiment in Exercise 1 has been set. Counting may also be done after class hours when the sun is not too hot, provided there is a teacher or a team leader supervising the activity.

Individual work should be compiled and data tabulated.

Have students prepare a table like the following:

Table 1. Densities of Plant A and Plant B in each of 5 to 10 quadrats taken in the school lawn, athletic field, etc.

_____school on_____

Quadrat Number	Number of Plant A	Number of Plant B
1 2 3 4 etc.		
Total		
Frequency (%)		

$$\text{Average density of Plant A} = \frac{\text{Total Number of Plant A}}{\text{Number of Quadrats}}$$

$$\text{Average density of Plant B} = \frac{\text{Total Number of Plant B}}{\text{Number of Quadrats}}$$

$$\text{Percentage of Frequency} = \frac{\text{Total Number of Quadrats Where Plants are Found}}{\text{Total Number of Quadrats}}$$

1. *Which plant has greater density?*
2. *Which has greater frequency?*

3. *Can you explain why this particular plant has greater density than the other? More frequently found than the other? What could be the possible reason or reasons for this?*

4. *Examine and compare the structure of the more densely and/or more frequently found plant. Is there any relationship between its structures and its being dense and/or less frequent? If so, what is the relationship? (Do the same for the less densely and/or less frequently found plant.)*

5. *From your table and pictorial map, can you see the distribution pattern of plant A and plant B? If so, which plant is more widely distributed? Why?*

6. *Is there any evidence of man's influence in this particular community? If so, cite the evidence.*

5. Conclusions

In your description of community structure and relationships, emphasize the effect of other populations and certain factors in the environment on the population size of a species.

Excerpted from: Philippines. Ministry of Education and Culture. Population Education Program. *"Teacher's guide in population education for science"*. Manila, PEP, 1978. p. 2-5.

CONTENT : INFLUENCE OF MAN ON PLANTS AND ANIMALS

OBJECTIVES :

1. *To identify how extensive cultivation results in deforestation and the loss of wild life habitat;*
2. *To identify examples from local situations of how deforestation results in soil erosion;*
3. *To show how the use of fertilizers causes soil leaching and pollution of water;*
4. *To explain how methods of irrigation have produced soil unfit for cultivation;*
5. *To comprehend the relationship between the use of pesticides, weedicides and some of its consequences on plants and animals;*
6. *To comprehend the impact of development of modern agricultural practices on the environment;*
7. *To appreciate the need for conservation of useful plant and animal life.*

GRADE LEVEL: HIGH SCHOOL

SUBJECT : SCIENCE

A. Preparation of Materials Needed

One copy each of Spring Boards I, II, III, IV and V should be available beforehand (attached at the end of this lesson). These could be handwritten or typed. Seek the help of pupils to have the Spring Boards written out.

The evaluation sheet in the form of a chart should be drawn on a large sheet of paper by the teacher.

B. PROCEDURE

1. Step I

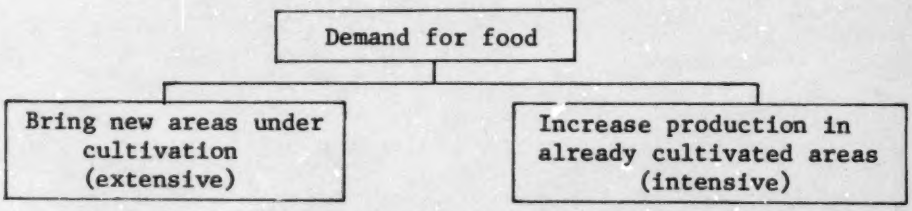
The pupils have an understanding of
- man's demand for food
- method adopted by him to increase production
- impact of these methods on plants and animal life.

The teacher while discussing these in brief, builds up a diagram on the chalkboard.

E.g. Post a question such as "Why did man have to increase the supply of food?" The response may be "more food is needed to feed the growing numbers". This could be written on the chalk board as "demand for food".

Next question could be "To satisfy his need what did he do?" This would include the two methods adopted by man to increase food production namely extensive and intensive cultivation.

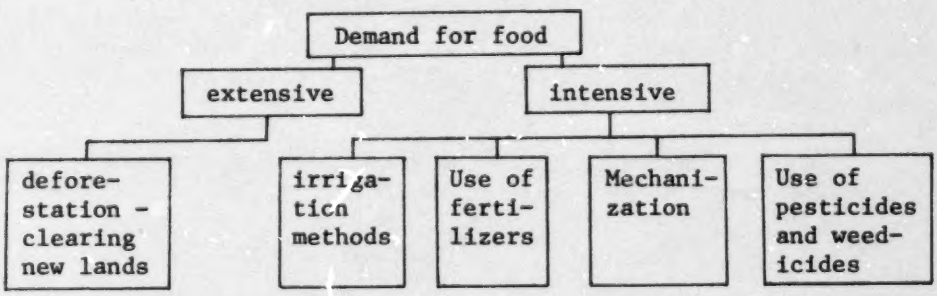
The diagram on the chalk board could be as follows:


Demand for food
Bring new areas under cultivation (extensive)
Increase production in already cultivated areas (intensive)

The teacher should now build up the lesson with questions such as:

1. *What did man do to bring new areas under cultivation?*
2. *What are the intensive methods adopted by him to increase production?*

The responses to these questions would go as those exemplified below in boxes:



2. Step II

At this point the teacher should get on to the new lesson on the consequences of man's actions in his attempt to increase food supply.

> In his sincere attempt to produce more food the actions of man have resulted in certain consequences. There are always the good effects of man's actions as well as the bad. Though the beneficial effects have helped to better our lives the ill effects are fast outnumbering the benefits and soon we may be faced with evil consequences which we may find difficult to overcome or remedy.

Before the pupils get down to discussing some consequences and building up the diagram on the chalkboard, the teacher should hand out the Spring Boards to the groups.

3. Step III

The pupil materials are in the form of passages with questions. The pupils are not expected to write the answers to these, but discuss in the group and note down if necessary the responses which should ultimately go into the boxes to build up the diagram on the chalkboard.

The teacher divides the class into five groups. Each group is handed one copy of a Spring Board. The group leader could read the passage to the others and each group tries to find the consequences of the methods adopted by man to increase food production. The teacher's help should be solicited when required.

4. Step IV

When the groups stop work, the teacher calls upon the numbers in the groups to mention some consequences of man's action as a result of the methods he has adopted to increase food production.

Group A which worked on Spring Board I on 'deforestation' would have arrived at soil erosion as a serious consequence of man's action. The teacher should elicit this from the group and write it in a box in the diagram, below the box 'deforestation'. The teacher would also include any other suggestions by pupils e.g. loss of wild life habitat.

Similarly, the teacher should write down in brief the responses of the groups and build up the lesson by completing the boxes - (see annexed diagram).

5. Step V

When all the boxes have been filled, the teacher should read out to the pupils the consequences of the methods adopted to increase food production, pointing to the diagram. All these consequences in turn affect plant and animal life including man. This could be the sum result of the consequences and should go as another box below the others (see diagram).

This would help pupils to arrive at the conclusion that certain actions of man upset the normal course of events which have repercussions on plants and animals including man himself.

6. Step VI

Referring to the diagram again the teacher should direct the pupils to think of ways in which man could minimize these repercussions.

> As long as the need for food is there, man discovers new methods to increase production.
>
> These methods have certain repercussions, but we cannot refrain from cultivating more land nor can we afford to ignore new methods.
>
> The only thing we can now do is to think of preserving whatever resources are left and adopt methods which would do least harm. Today people are conscious of the changes man brings about in the environment and some of its consequences. The forests, soil and water and the animal life that depends on these should be cared for if the earth is to continue to be a pleasant place for mankind.

Instill in the pupils an understanding of the value of our resources and the need to conserve them.

Elicit from pupils answers to questions such as:

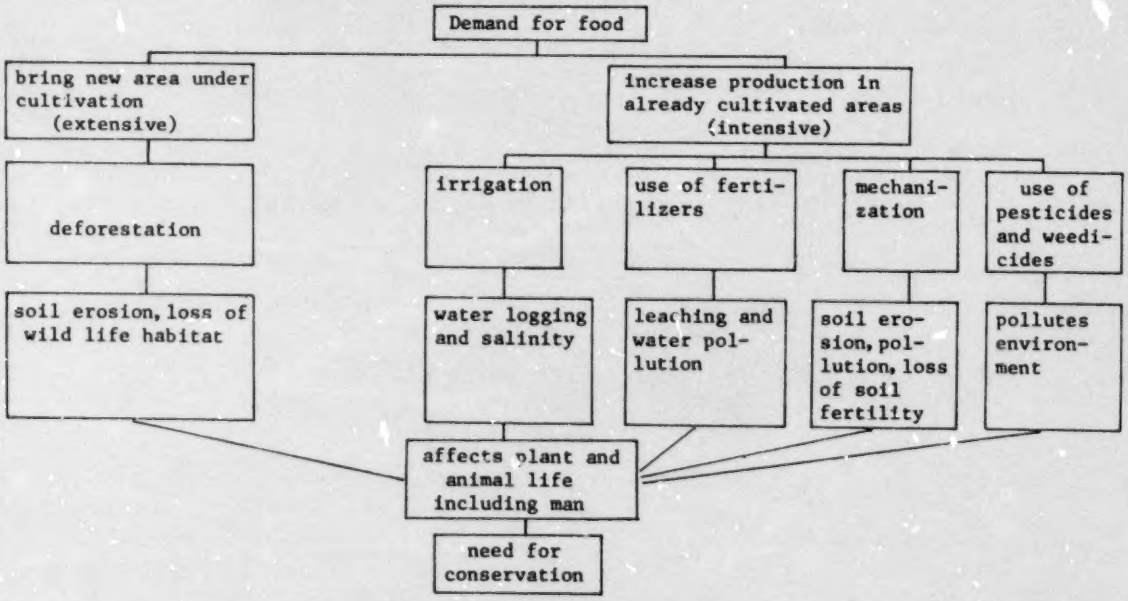
1. *Why should we protect our forests?*
2. *How do we preserve wild life habitat?*
3. *How can we prevent soil erosion?*
4. *Why is it necessary to test the soil before using manure?*
5. *Why is it important to select suitable methods of irrigation?*
6. *How can we minimize the harm done to nature by the use of pesticides?*

Probable answers would be

- maintain balance among living things; prevent floods.
- protect animals in sanctuaries; prevent destruction of plants.
- careful choice of land; cultivation of cover crops; contour ploughing; build retaining walls.
- use suitable fertilizers in correct quantity to replenish soil causing less run off.
- suitable methods depending on nature of land has less harmful effects.
- biological control of pests does less harm; rotation of crops prevents disaster by pests and this helps to reduce the use of pesticides.

This discussion would lead the pupils to realize the importance of conservation.

The teacher completes the diagram by adding the last box which would be <u>need for conservation</u>.


Demand for food
bring new area under cultivation (extensive)
increase production in already cultivated areas (intensive)
deforestation
irrigation
use of fertilizers
mechanization
use of pesticides and weedicides
soil erosion, loss of wild life habitat
water logging and salinity
leaching and water pollution
soil erosion, pollution, loss of soil fertility
pollutes environment
affects plant and animal life including man
need for conservation

C. EVALUATION

Have the following chart drawn on a large sheet of paper and pin it up on the chalk board. The chart consists of 3 columns.

The first column gives the actions of man in his attempt to increase food production.

The second column gives the possible consequences of his actions. The third gives methods of conserving our resources from being destroyed.

Instruct the pupils to look at the chart and note down the matching items in each column.

E.g. Item No. 4 in Column I has as its consequence Item No. 1 in Column II. Method of preventing this and conserving the resources is given in. Item No. 4 of Column III. So the answer could be written as 4 - 1 - 4. Similarly, request the students to match the other items in the chart.

The answers are:

1 - 5 - 2
2 - 4 - 1
3 - 2 - 5
4 - 1 - 4
5 - 3 - 3

(These items could vary slightly depending on the local situation).

EVALUATION

	Man's Actions		Possible Consequences		Methods of Conservation
1.	- cutting down forests for agriculture.	1.	- water logging salt deposits in soil.	1.	- use of pesticides and weedicides.
2.	- monoculture.	2.	- destroys useful organisms - pollution.	2.	- careful choice of land - cultivation of cover crops - contour ploughing - build retaining walls.
3.	- use of insecticides and weedicides.	3.	- water pollution by chemicals	3.	- minimize use - soil testing and use of suitable manure - clean up water bodies to prevent stagnation.
4.	- new methods of irrigation.	4.	- increases growth of pests and weeds - destroys useful organisms necessary for balance of nature.	4.	- care and forethought in adopting methods of irrigation to suit nature of land.
5.	- use of fertilizers	5.	- soil erosion - silting - floods	5.	- use of chemicals which are selective in their action - using alternative methods of biological control - rotation of crops.

Spring Board I

Read the following questions and try to find the answers with the help of the passage given below:

1. *What happens to the soil when trees are cut down?*
2. *Why should we preserve the soil without it being washed away?*
3. *How is wild life affected by the loss of forests?*
4. *Try to form a chain of events from the time a forest is cleared and not how it affects plant and animal life.*

Vast areas of forest lands have been cut down to make land available for agriculture. These forests are important in maintaining the balance among living things; they give off oxygen and when they decay they restore plant foods to the soil. Their most important function is that they hold moisture in the soil and prevent floods. Once the forests have been cut down floods may occur and much valuable soil is lost. In some parts of the tropics an acre of hilly cultivated land may lose 100 tons of soil per year in this way.

As man occupied new regions by cutting the forests and using up the plains, much wild life was destroyed. Many animals have become extinct as a result of man's wilful destruction and many more will become extinct if we do not recognize the need for care in the conservation of our native animals and plants. Wherever man has entered with his axe and plough he has disturbed the plant/animal relationship which results in the proper balance among all living things.

Spring Board II

With the help of the passage given below find the answers to the following questions:

1. *How has the irrigation system in our country helped to increase production?*
2. *How does irrigation cause salinity of the soil?*
3. *What happens when the drainage system is disturbed?*

Irrigation, which agricultural man has practiced as early as 6,000 years ago, has played a great role in increasing food production, by bringing into profitable cultivation vast areas that would otherwise be unusable.

The many irrigation methods adopted by man have resulted in the reshaping of the water cycle with unwanted side effects. One

is the raising of the water table caused by the disturbance of the drainage system. After a period of time due to accumulation of water underground the water table may rise to within a few inches of the surface. This not only obstructs the growth of plant roots by water logging, but also results in the surface soils becoming salty as water evaporates through it leaving a concentrated deposit of salts in the surface. Such a situation developed in West Pakistan after its fertile plain had been irrigated with water from the Indus for a century. This has been repeated many times throughout history in various countries of the world.

Spring Board III

Read the following questions. Try to find the answers to these with the help of the passage.

1. *How is underground water polluted by chemical fertilizers?*
2. *What effect does run off of chemical fertilizers, have on rivers and lakes?*
3. *Can you think of any examples of dying water bodies in your area?*
4. *Does this effect the fauna and flora in your region?*

Chemical fertilizers did not come into widespread use until this century. The pressure of population and the disappearance of new lands forced farmers to substitute fertilizers for the expansion of crop lands to meet growing food needs. Experience has shown that proper utilization of water and fertilizer with other inputs and practices can double, triple, or even quadruple the productivity of intensively farmed soils.

The use of fertilizers has benefited man enormously. But the benefits are not without side effects. The run off of chemical fertilizers into rivers, lakes and underground waters creates two important hazards. One is the chemical pollution of drinking water. In certain areas the nitrate content of well water has risen to toxic levels. The other, a much more extensive hazard, when inorganic nitrates and phosphate discharged into lakes and other bodies of fresh water provide a rich condition for the growth of algae. This in turn depletes the water of oxygen and thus kills off the fish life. This slowly brings about the death of the lake and converts it into a swamp.

Spring Board IV

Read the following questions. Find the answers with the help of the passage given below:

1. *How does mechanization cause soil erosion?*
2. *How does its ill effects weigh against its benefits?*
3. *Does mechanization suit your area? Why or Why not?*

Mechanization has helped to bring under cultivation large extents of land which helped to produce more food for the fast increasing human population. The replacement of animals by machinery has also helped in cultivating a number of crops in a year. The invention of the internal combustion engine and the tractor has been a great breakthrough in agricultural practice.

The early farming methods did little harm to the land. It took hours of hard labour to plant and harvest an acre of crop. Today the picture has changed. A tractor purrs over an acre of ground hauling many ploughs which dig deep into the top soil. The same acre that used to require hours of labour now takes less than a few hours.

But power machinery for all the boon it has been in increasing the food supply has played its part in causing soil erosion. Land which is dug up and broken into tiny bits by power machines is easily eroded by water and winds. These machines also pollute the air with the poisonous gases they emanate. Moreover with a quick succession of crops at short intervals the soil loses its fertility faster than it normally would. This will have to be replaced with the addition of fertilizers which would be an additional expense to the farmer. In many countries the machinery has to be imported and large sums of money are spent on these, whereas cheap labour goes unused. In the Asian region where land is fragmented into small holdings mechanization proves uneconomical.

Spring Board V

With the help of the passage given below, try to find the answers to the following questions:

1. *Do you think it is possible to cultivate crops without the use of pesticides today?*
2. *Why is DDT considered dangerous?*
3. *How do pesticides and weedicides affect the environment?*

One of the outstanding developments of the twentieth century has been man's success in combating and controlling the many competitive weeds and agricultural pests. Yet this has not been achieved without some threat to man and his environment.

Left to nature's own will the natural biological control exerts an influence on the unlimited growth of any one species. But due to man's intervention and modern agricultural patterns

this balance has been upset and the necessity to use pesticides for controlling unwanted plants and diseases and insect pests has greatly increased.

The detrimental effects of many agricultural chemicals might well outweigh the benefits derived were they not used with forethought and care. Though the majority of these are turned into harmless products and absorbed by the environment, others persist for years or decades accumulating in dangerous concentrations and providing a continued threat to normal growth.

DDT was found in the tissues of animals over a range of life forms. Carnivores are particularly likely to concentrate DDT in their tissues because they feed on herbivores that have already concentrated it from large quantities of vegetation.

In the practice of monoculture it has become necessary to spray pesticides and weedicides at regular intervals. This, when done from the air, pollutes the environment causing considerable damage to other plant and animal life of the area, which are vital to maintain the balance of nature.

Excerpted from: Sri Lanka. Curriculum Development Centre. Population Education Unit. *"Man's influence on the resources and environment - a learning unit"*. Colombo, CDC, 1976. p. 1-11.

CONTENT : THE BIOSPHERE

OBJECTIVES :

1. *To state that man is an important component of the biosphere;*
2. *To recognize that with agriculture and the discovery of fire, man began to change the environment to his advantage;*
3. *To recognize that with man's higher aspirations of life, his needs began to increase rapidly;*
4. *To recognize that the changes caused in the biosphere due to man's actions are increasing with the increase in their numbers, standard of living, and with the advancement in technology.*

GRADE LEVEL: HIGH SCHOOL

SUBJECT : SCIENCE

A. Instruction to the Teacher

Show on the chalkboard a neatly labelled diagram of a suitable model, showing the physical environment, plants and animals including pre-historic man. This diagram should be ready for the lesson well in advance. The diagram shown below may serve as an illustration. See Figure 1 below:

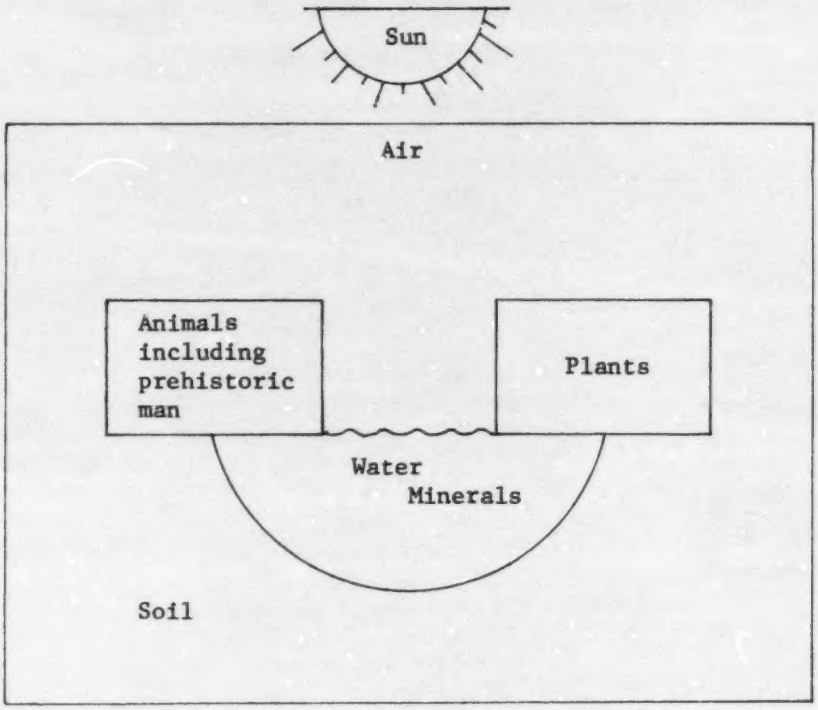


Figure - i

1. Step I - Procedure

Focus the attention of pupils on the diagram. Use it as the starting point for a short discussion. Through this discussion first recall the interrelationship that exist between plants and animals and between these organisms and physical components of the biosphere. Show these interrelationships on the diagram by means of arrows. Use coloured chalk for this purpose. See Figure II. Now draw the pupils' attention on the words that read "the pre-historic man" in the diagram. Make it quite clear to the pupils that pre-historic man is yet another member in the biosphere.

Elicit that pre-historic man had limited needs, and these needs be obtained from his immediate environment without disturbing it very much.

Discussed the interrelationships between pre-historic man as a hunter, and plants and animals in his environment. Show these interrelationships on the diagram too by means of arrows. See Figure II below.

Discussion points

a) Pre-historic man ate such plant food as yams, leaves, seeds, fruit, etc.

b) As a hunter he ate raw meat, fish, eggs, etc.

c) He did not have any clothes to wear. He used hides of animals to cover his body.

d) He went from place to place in search of food in the jungle. Thus he had to frequent places where there were wild animals with whom he had to compete for food.

e) During pre-historic times the number of people was less, and each person had a large area of land (jungle) at his disposal for hunting, etc.

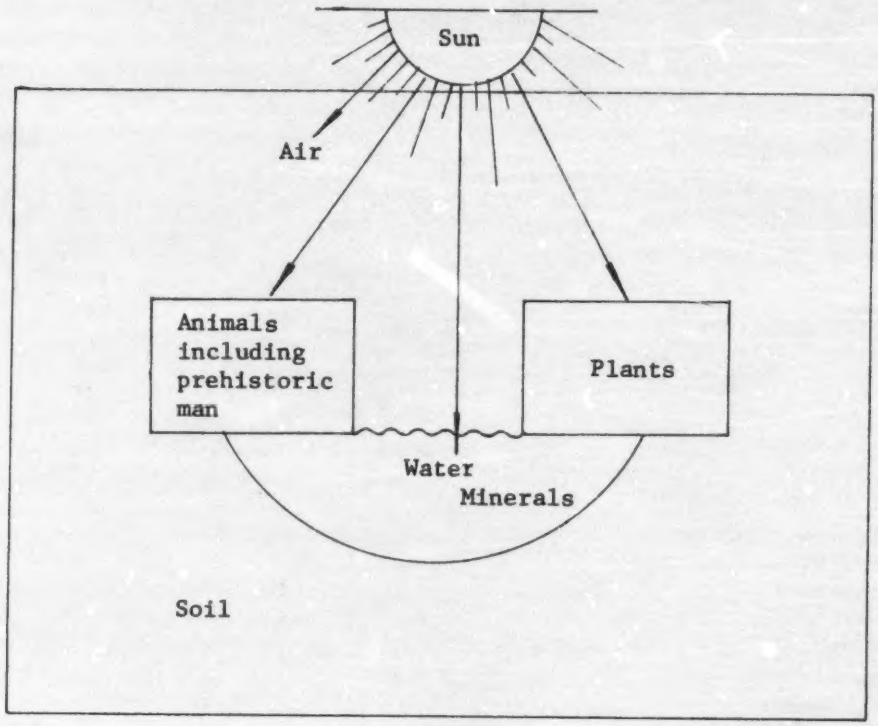


Figure - 2

2. Step 2

Draw the attention of pupils to the diagram once again. Discuss how primitive man later began to control the animals and plants and even the soil to satisfy his needs. In the discussion consider the following:

a) Primitive man later began to open up land for agriculture by destorying forests.

b) He started cultivating the land he had cleared up, with crops such as rice, wheat, maize etc., which gave him rich harvests and better food. In this manner he had been able to gain control over a larger area of land.

c) Primitive man later domesticated animals for the purpose of food, defence, and transport etc. Certain animals like horses, camels, cattle etc., were used in agriculture.

The pupils at this stage should see the new interrelationships primitive man had established later between himself and the biosphere (animals, plants, soil, water, air etc.)

During this discussion these interrelationships could be shown to the pupils by means of arrows drawn on the diagram. See Figure III below. Use coloured chalk to draw arrows.

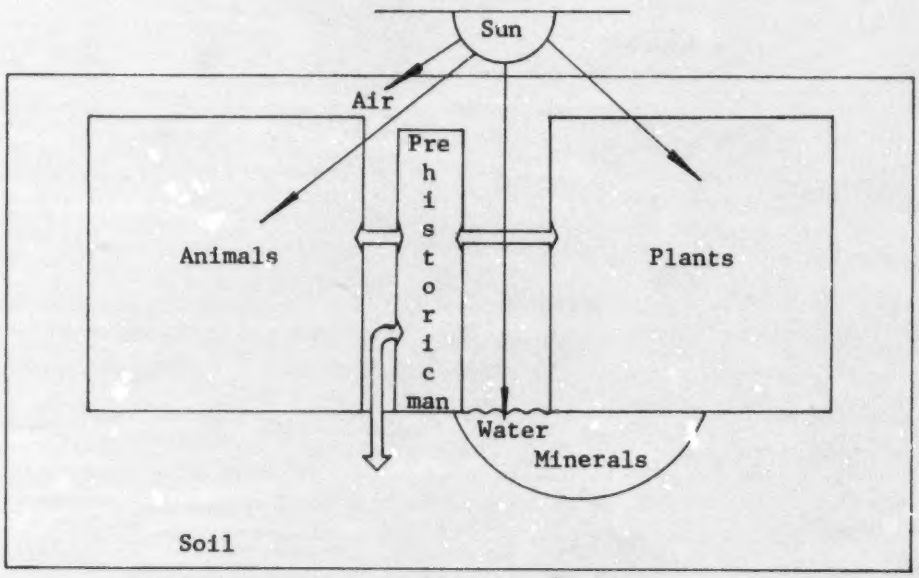


Figure - 3

3. Step 3

Focus attention on "modern man" using the same diagram. Through a short discussions elicit how he has been able to exercise much greater influence on the biosphere than did primitive man.

Discussion points

a) Man began increasing in numbers.

b) More land had to be brought under cultivation.

c) He used new machines, high yielding seeds, new breeds of animals, etc.

d) Clearance of forests for cultivation purposes could lead to depletion of soil.

e) Chemicals are being added to the soil, in an effort to get more produce from plants, and to protect crops from weeds and pests.

f) Modern man does not allow unwanted plants to grow, as he concentrates only on those plants that are useful to him.

g) Animals that are not useful to him are driven away or destroyed by him, those that are useful are reared by him.

h) When he burns; fuel, smoke, carbon etc. enter the atmosphere.

i) He uses water profitably in agriculture, industry, etc.

The above discussion should lead to the following:

i) Modern man exercises much greater control over plants, animals, soil, water etc.

ii) He adds things to the air, soil, water.

State in general that changes brought about in the biosphere through the actions of modern man are ever increasing.

4. Step 4 - reinforcement and evaluation

Divide the class into groups. Hand over to each group a copy of the passage given below. Let the pupils read this passage. Explain it if necessary.

"One of the most important things primitive man discovered was "fire". He used fire to achieve a number of his needs. He used fire to cook his food, instead of eating it raw. Fire was also used to keep his body warm during cold weather. Primitive man protected himself from wild animals by setting up big fires, for fire keep the wild animals away from him.

Subsequently, man in addition to being a hunter began living in a fixed place making agriculture his chief occupation. Very soon he was able to establish colonies, opening up land for the cultivation of crops like rice, maize, barley, millet, etc.

Meanwhile domestication of animals, development of animal husbandry etc., received his attention. Goats, pigs, sheep, cattle, etc. were among the animals he had domesticated. Under these circumstances man preferred to live in a permanent place developing agriculture and animal husbandry."

Let the pupils answer the following questions in their record books. Teacher to go through the exercise with the pupils.

Fill in the blanks

I. *Primitive man got his food from plants and animals he found in the environment:*
Later he grew ..... for his food and other needs.

II. *Man started living in colonies.*
He cultivated crops like .....

III. *Man discovered fire.*
He used fire to cook his .....to prevent wild ..... harming him, and to provide ..... during cold seasons.

Excerpted from: Sri Lanka. Curriculum Development Centre. Population Education. *"Man's influence on the resource and environment - a learning unit".* Colombo, CDC, 1976. p. 1-8.

CONTENT : COMMUNITIES AND ECOSYSTEM

OBJECTIVES :

1. *To name orally or in writing six to ten resources;*
2. *To classify mineral resources according to a given classification table;*
3. *To describe orally or in writing what influences the use of these natural resources;*
4. *To give two to four reasons for defending or rejecting the following statement: With our present technology, we are capable of substituting synthetic resources for our natural resources; therefore, natural resource depletion is an exaggerated threat to man's existence.*

GRADE LEVEL: HIGH SCHOOL (SECOND YEAR)

SUBJECT : SCIENCE

A. Unit Development

1. Concept

Rapid population growth's increased demand for manufactured goods may result in the exploitation and/or depletion of mineral resources.

2. Sub-concept

Minerals are used as raw materials or sources of energy in the manufacture of goods or products.

3. Teaching activity 1 - lecture discussion

Materials

a) Samples of products which use minerals either as raw materials or as sources of energy in manufacturing them. Give examples for A.

b) Samples of products where manganese is used as a raw material in the manufacture of:
   i) dry batteries
   ii) glass
   iii) paint and varnish
   iv) ceramic glazes
   v) coloured cotton cloth
   vi) pigments used in protective coatings for steel
   vii) medicinal manganese salts such as:
      a) glycero-phosphate
      b) lactate
      c) pheno-sulphonate

c) Match heads.

B. PROCEDURE

A day before this activity is taken up, assign a student to read on minerals and to prepare a report on it. Assign the rest of the class to bring samples of products which make use of minerals such as copper, gold, manganese, silver, clay, etc.

Start the activity by asking the students, one by one, about the product that they brought. Say:

1. *What product did you bring?*
2. *What kind of mineral or raw material do you think was used in making it?*
3. *What source of energy was used?*

Then assign someone to make a table on the chalkboard with the following headings: (Words in parentheses are for the teacher).

Product	Raw Material	Use in daily life (check)		
		Much	Not Much	No Use
(glass)	(silicate) (soda) (lime) Etc.			

Let the students who have identified the products they brought fill in all the spaces properly.

Then help the rest identify minerals used in the samples they brought. In case no one can identify them, assign an identification exercise.

Discuss the tabulated data. Say:

Which mineral was used primarily as a raw material? Which materials are in demand? Why? How will this affect the supply? What will happen if there is an increase in the number of users?

Now, ask the student who was previously assigned to give a report on minerals.

During the ensuing discussion ask the students what may happen if RPG (rapid population growth) demands more of these products. Ask the following questions:

1. *What kind of resources are minerals? Are they renewable? Why or why not?*
2. *In what ways are minerals used by man? Does RPG affect the use of minerals? How?*
3. *How will RPG affect the supply of minerals? (The fourth column of the table previously made can help bring this out. Use it as a springboard to subsequenct discussions.)*
4. *How can we make the supply last longer?*
5. *In the long run, if RPG continues, can man make the supply last longer? Why or why not?*

1. Concept

Rapid population growth may stimulate new ways of reusing renewable resources.

2. Sub-concept

Continued technological advance and recycling of renewable resources is stimulated to cope with the demands of RPG for goods, water, food and power.

3. Teaching activity 1 - Debate

4. Materials

1. Newspapers: "Papier-mache" articles made out of paper.

2. Articles

a) "New Things from Scraps," Philippine Daily Express March 31, 1973, p. 31, columns 1 to 5.

b) "By-product," Philippine Daily Experess, April 5, 1973, p. 28, columns 3 and 4.

c) "Welcome to Spectacle Island," Philippine Daily Express, April 2, 1973, p. 23, columns 1 and 2.

d) "Crud?" Philippine Daily Express, March 30, 1973, p. 24, columns 4 and 5, p. 25, columns 1 to 5.

e) "Environmental Pollution," Reprint from the World Bank Encyclopedia, c. 1972, Field Enterprises Educational Corporation, Chicago, Illinois.

C. PROCEDURE

Start the activity by organizing the class to prepare for a debate defending or rejecting the statement: With our present technology, we are capable of substituting synthetic resources for most natural resources; therefore, natural resources depletion is an exaggerated threat to man's existence.

The debate is a device for getting the student to think through both sides of a question that has important possibilities for problem solving.

To ensure that the debate is not just a superficial discussion or an off-top-of-the head response to a serious issue, it is suggested that the teacher establish the following requirements:

1. An outline, listing several references, main points of argument, and provocative questions to stimulate discussion should be submitted in advance by members of the debating team.
2. Involve the class in emphatic consideration and cognitive growth by having half of the class act as supporters for one side of the debating team and the other half of the other side.
3. Adhere to the time table set-up. One suggestion is initial presentation by each of the two sides; pro, four minutes; con, four minutes; con, four minutes and pro, four minutes. A toss-up for rebuttal will allow one speaker from each side to reply to the arguments of the other side. All this may take about twenty-four minutes. The rest of the class period can be allocated to free discussion without time limits, allowing each half of the class to resume their own individual preferences. If prejudices are revealed, untouched by the logical

arguments presented, the teacher may focus class discussion on these prejudices.

4. Follow-through experiences can include student essays or case studies, showing of picture clippings on bulletin boards, etc., on the given topic.

Explain how to participate in a debate either as a member of the debating team or as supporters.

Allow the class sufficient time to prepare for the debate.

Let the class have the debate, then institute follow-through experiences.

Excerpted from: Philippines. Ministry of Education and Culture. Population Education Programme. *"Teacher's guide in population education for science"*. Manila, PEP, 1978. p. 11-14.

CONTENT : MALNUTRITION AND UNDERNUTRITION

OBJECTIVES :

A. To impart knowledge about the problem of malnutrition and undernutrition and to develop the following understandings:

1. *Malnutrition and undernutrition are two forms of nutritional deficiency;*
2. *People are likely to suffer from either one or both the deficiencies;*
3. *Malnutrition and undernutrition result in poor health and diseases;*
4. *Malnutrition and undernutrition have adverse effects on socio-economic conditions.*

B. To develop the ability to:

1. *Distinguish between malnutrition and undernutrition;*
2. *Select some methods to control nutritional deficiency;*
3. *Read and interpret charts, diagrams and statistics relating to malnutrition and undernutrition;*
4. *Identify relationship between nutritious food and the health of the population.*

C. To develop skills in:

1. *Identifying symptoms of possible nutritional deficiency;*
2. *Preparing graphs and charts depicting common nutritional deficiency manifestations, the school children have shown over a particular period;*
3. *Participating effectively in group discussion.*

D. To develop the appreciation of:

1. *The relation between malnutrition and undernutrition and the socio-economic aspects of life;*
2. *The measures undertaken to combat nutritional deficiency and to improve national health.*

GRADE LEVEL: HIGH SCHOOL

SUBJECT : SCIENCE

A. CONTENT

1. The meaning of malnutrition and undernutrition

An intake of the adequate quantity of the right kind of food is essential to maintain health. Just as an excess of food is harmful for the body, eating insufficient food is also harmful. When the diet is deficient it may lead to nutritional deficiency which may occur as undernutrition or malnutrition. When the diet is insufficient and does not provide the necessary amount of energy needed per day by an individual, it results in undernutrition. Malnutrition is produced when the diet is ill balanced and fails to provide the required nutrients of food viz., proteins, fats, carbohydrates, vitamins and minerals in proper proportions.

2. Causes

Some of the important causes are:

a) i) Shortage of foodstuff in proportion to the need of the growing population in developing countries; and
   ii) Prolonged drought and famine.

b) By and large, few people can afford to purchase quality protein foodstuff which is relatively expensive.

c) People are generally ignorant about nutrition. They do not know how to plan a diet for the family and post weaning children are found to suffer from protein malnutrition. Cooking methods are also equally responsible for loss of nutrients during preparation, cooking and service.

d) Physical and environmental factors such as poor ventilation, lack of sunshine, overcrowding, insufficient sleep, overwork and lack of physical exercise also affect the nutritional status of an individual.

e) If the expectant and nursing mothers do not get proper nutrition, infant nutrition suffers.

3. Symptoms of nutritional deficiency

a) Symptoms of undernutrition

i) Loss of interest in work;
ii) Inability to concentrate
iii) Lack of mental alertness;
iv) Fatigue;

v) Gradual loss of weight;
vi) Retarded physical and mental growth (in case of children).

b) Symptoms of malnutrition

i) Lack of flesh or excessive flabbiness;
ii) Physical deformities;
iii) Rough and wrinkled skin;
iv) Ill growth of bones and teeth - late teething in children;
v) Digestive troubles;
vi) Ailments and disorders like headache, pale appearance, fatigue, sleeplessness, mental apathy, etc.

c) Effects on health

The effects of malnutrition are usually insidious and no signs could be detected unless the cases are prolonged.

The effects are:

i) Physically, the person becomes weak, less energetic and loses his capacity for work.

ii) Mentally, he becomes inert, apathetic and loses interest in all activities.

iii) The person gradually loses his body resistance and becomes susceptible to various diseases specially tuberculosis.

iv) Deficiency diseases may occur due to the lack of specific nutrient in the diet for example Kwashiorkor due to protein-calorie deficiency, beri-beri due to vitamin B deficiency, rickets due to vitamin D deficiency, scurvy due to vitamin C deficiency and goitre due to iodine deficiency. The most harmful effects of undernutrition and malnutrition are the increased incidence of deaths and the general lowering of health particularly among children. The general death rate, infant mortality rate and maternal mortality rate figures in India are quite high as compared to those in advanced countries. The average expectancy of life in India is quite low as compared to U.K. and U.S.A.

d) Socio-economic implications

i) Nutritional deficiency among people specially among the industrial and agricultural workers

causes low vitality. It reduces their capacity to work and consequently retards the industrial and agricultural production.

ii) Prolonged illness of the wage earner brings disaster to families.

iii) Nutritional deficiency in infants and pre-school children causes a permanent retardation of the physical and mental growth. As a result, the population is likely to be physically, mentally and economically substandard.

e) Methods of control

Children are often the subjects of malnutrition unless adequate steps are taken to prevent it. Some important methods of control of nutritional deficiency are as follows:

i) Parents need to be educated about the nutritional needs of the family and particularly of the young child through Parent-Teachers Associations.

ii) Provision should be made for a periodical medical checkup of the school children by doctors. This could be done by School Medical Officer where the scheme of School Health Service is in operation. The cause detected should be properly treated.

iii) Children should be provided with nutritious meals or snacks in the school. A supplementary feeding programme should be launched in every institution and the programme should be subsidized by the authorities. This opportunity should also be used for imparting nutrition education to the children.

iv) The teaching of nutrition in the classroom should be more meaningful.

v) Interesting, educative and informative charts and posters may be displayed on bulletin boards.

B. Teaching Hints

Here are some teaching hints.

1. Pupils conduct a group discussion on the following:
   a) The concept of nutrition;
   b) The need of nutrition education of the family.
2. Help the pupils prepare charts about the food habits and practices of the family, per capita consumption of

various items of food of a few countries like India, Japan, U.K., U.S.A. and U.S.S.R.

3. Help the children collect data relating to the population growth and

   a) per capita consumption of food;
   b) health statistics in India and in a few advanced countries like Japan, U.S.A., U.K., and U.S.S.R.

4. The teacher distributes cyclostyled copies of extracts of reports of some glaring cases of malnutrition and their control. Let the pupils draw their own inferences and report the implication to the class.

5. Divide the class into small groups and assign to each group one of the following topics as the subject of a brief essay:

   a) Kwashiorkor;
   b) Rickets;
   c) Obesity;
   d) Pellagra.

   The group reports may be read out later on and discussed for the benefit of the whole class.

6. Arrange visits to enable pupils to study for themselves:

   a) Programme of school health service especially the role played in relation to nutritional deficiency.
   b) Mid-day meal programme.
   c) Applied nutrition programme.
   d) Any other active nutrition programme.

7. Arrange for film shows on nutrition and follow-up discussion.

8. Arrange for a talk by a nutritionist.

9. Pupils can collect newspaper clippings, and pictures on topics relating to nutrition and maintain them in a scrap book.

10. Arrange for an annual exhibition on Nutrition. Different meals, low-cost high protein diet and use of substitute foods can be displayed.

C. Evaluation

Unit Test

Time: 40 Minutes

A. General Instructions:

1. This paper is divided in two sections: Section A and Section B. Proceed on serially from Section A to Section B.
2. Do not try to read the whole question paper.
3. In case you find any question difficult, do not waste time on it. Proceed to the next and come back to it at the end.
4. All questions are compulsory both in Section A and Section B.
5. All questions of Section A carry one mark each. In Section B questions No. 11 to 15 carry two marks each and question No. 16 carries five marks.
6. Answer questions of Section A by marking a tick mark against the correct alternative in the space provided.
7. Answer question numbers 1 to 15 in about 5 lines and question No. 16 in about 10 lines.

Section A

Q. 1. Undernutrition is caused by taking:

-A. Excess of food.
-B. Less quantity of protein.
-C. Ill-balanced diet.
-D. Less than the requisite quantity of food.

Q. 2. From the following statements regarding the effects of nutritional deficiency, pick out the one which is not true.

-A. The child becomes strong and energetic.
-B. The child becomes inert and apathetic.
-C. The child loses his body resistance.
-D. The child may develop rickets.

Q. 3. The nutritional deficiency of the school children can be controlled by:

-A. Organizing Parent-Teachers Association.
-B. Provision of mid-day meals in schools.
-C. Provision of periodical checkup by doctors.
-D. Organizing programmes of nutrition for the community.

Q. 4. Malnutrition leads to:

-A. The development of body resistance.
-B. The decreased incidence of deaths among infants.
-C. The development of Goitre.
-D. The increased interest in all activities.

Q. 5. Nutritional deficiency should be controlled because:

-A. It increases the body resistance to diseases.
-B. It improves the physical and mental growth of infants and pre-school children.
-C. It improves the income of families.
-D. It leads to poor performance of Indian labour.

Q. 6. The correction of malnutrition in children is aimed against:

-A. Under feeding the children.
-B. Properly planning the diet for children.
-C. Lesser use of fried foods.
-D. Poor protein substitute in post weaning children.

Q. 7. Undernutrition is accompanied by:

-A. Gradual gain in weight.
-B. Ability to concentrate.
-C. Fatigue.
-D. Increased interest in work.

Q. 8. Malnutrition is accompanied by:

-A. Proper growth of bones and teeth.
-B. Rough and wrinkled skin.
-C. Mental alertness.
-D. Proper digestion.

Q. 9. Choose the correct statement.

Malnutrition results in:
-A. Increase of body resistance.
-B. Development of kwashiorkor.
-C. Lowering of infant mortality rate.
-D. Development of mental alertness.

Q.10. The control of nutritional deficiency is possible by:
-A. Proper treatment of the cause.
-B. Inadequate provision of open places.
-C. Keeping the food production at a constant level.
-D. Not organizing any programme of nutrition education for the family.

Section B

Q. 11. What do you mean by malnutrition? How does it differ from undernutrition?

Q. 12. Give three important causes that bring about nutritional deficiency in people.

Q. 13. Name three deficiency diseases that might result from lack of nutritional food.

Q. 14. Name four symptoms of malnutrition.

Q. 15. Name two important objectives of the programme of mid-day meal in schools in the control of nutritional deficiency.

Q. 16. What are the socio-economic implications of nutritional deficiency in relation to Indian labour.

Excerpted from: India. S.C.E.R.T. Population Education Cell. *"A package of model lessons in population education"*. Bihar, Patna, 1983.

CONTENT : DISEASES CAUSED BY MALNUTRITION

OBJECTIVES :

1. *To enable the students to appreciate the importance of nutrition for living organism;*
2. *To develop in the students the concept of population growth and the capability of correlating the growth with the non-procurement of nutritious food;*
3. *To inculcate the ability in the students to appreciate the value of nutrition and nutritious food for sound human health;*
4. *To develop in the students a scientific outlook regarding life and population control for meeting the problems caused by scarcity of nutritious food, for better health.*

GRADE LEVEL: HIGH SCHOOL

SUBJECT : BIOLOGY

A. Overview

Students have been well-acquainted with the population in India and the world, their causes, conditions and conseqences on the human life in their previous lessons in different subjects. This lesson is intended to impart the knowledge to the students about nutrition and the diseases caused by under and malnutrition.

B. Content

1. Composition of living organism: materials, organic and inorganic.
2. Functions of organism: (a) development; (b) decay.
3. Function of food in the organism, to provide it with: (a) energy - its source; (b) development of organism by

constructing new cells; repairing of the old and destroyed cells; (c) equilibrium among different parts of the organism.

4. Ingredients of balanced diet: carbohydrates, protein, fat, minerals salt, vitamin A, vitamins B, B1, B2, B6, B12, and water.

5. Nutrition:

a) Definition:

Nutrition is a combination of processes by which the living organism receives and utilizes the materials necessary for its maintenance, function, growth and renewal of its components.

b) Kinds:

- Nutrition: Both quantity of food and calcries required are present for healthy development.
- Undernutrition: Required quantity of food is available but required calories are not available. E.g. if a man consumes 500 grams of every ingredient of a balanced diet in his food, he gets balanced and nutritious food, but if he consumes 400 grams of rice and 100 grams of potatoes, then he would be consuming the required quantity of carbohydrates only. By lacking other nutritious value in food, undernutrition will result.
- Malnutrition: Neither required quantity of food nor required calories is available in food.

c) Calories:

- Calorie requirements for an average man as per WHO recommendation - 3,300 calories - position of an average Indian - 2,940 calories per day.
- Difference of requirement of calories according to different age group, as per following table:

Age group	Unit of required calories
2 years	900
2-5 years	1,200
6-9 years	1,500
10-12 years	1,800
12-14 years	2,100
14-16 years	2,400
average man	3,000
peasant	3,200 to 4,000
hard workers	4,000 to 5,000
Girls and women	
13-15 years	2,600
16-19 years	2,400
Women	
Doing light work	2,100
Doing general work	2,500
Doing hard work	3,200
Pregnant	2,100
Breast feeding	2,700

d) Source of nutrition:
- Ingredients of the balanced diet, i.e. carbohydrate, protein, fat, vitamins, etc.
- Vegetable and fruit.
- Medicines - capsules, vitaminous syrups, tablets.

e) Diseases caused by nutritional deficiency:

Nutritional deficiency	Diseases caused
i) carbohydrates	a) Loss in weight b) Diarrhoea c) Vomiting d) Loss in appetite e) Nausea f) Laziness

Nutritional deficiency	Diseases caused
ii) Protein	a) Inflamation on face b) Thin hair c) Swollen stomach d) Decay of the cells e) Irritation f) Loss of blood
iii) Fat	Effect on skin: a) Eczema b) Itching
iv) Vitamin A	a) Blindness b) Night blindness
v) Vitamin B	a) Beriberi b) Loss of appetite c) Fatigue d) Nausea e) Swelling of limbs f) Constipation g) Paralysis h) Heart pain
vi) Vitamin B2	a) Redness of tongue b) Loss in vision c) Dryness in skin
vii) Vitamin B6	a) Diptheria b) Obstruction in physical development c) Convulsion
viii) Vitamin B12	a) Jaundice b) Respiratory trouble
ix) Vitamin C	a) Scurvy b) Teething trouble c) Trouble in walking d) Weakness e) Respiratory trouble
x) Vitamin D	a) Rickets b) Tooth decay c) Uncontrolled development of muscle d) Over-projection of forchead e) Deformation of head
xi) Vitamin E	a) Deformity in eyes b) Frigidity in females
xii) Vitamin K	Lack of sedimentation of blood.

f) Effects of undernutrition and malnutrition:
- Loss of diseases-counter-acting factors
- Ill health
- Spreading of diseases
- Loss of strength
- Decrease in the productive capacity
- Absenteeism from employment
- Decrease in income
- Low standard of living

g) Relationship between population growth and nutrition; Effects of population growth on the procurement of nutritious food for low income group population; Health conditions of the children.

C. Teaching-Learning Strategy

The teacher:

1. explains the function of organisms to the class with the help of diagrams and charts.
2. guides the students in preparing the charts showing the source of ingredients of a balanced diet among the locally available commodities. These should be displayed in the school.
3. organizes excursion specially in labour-dominated areas and slum areas and makes the students observe the poor health conditions of the children.
4. encourages the students to appreciate the fact that there is a direct relation between growth of population and difficulties in procuring nutritious food based on limited income.
5. uses the following tables for explaining, stressing and focusing the point that due to rapid growth of population it has become difficult to procure and provide a balanced and nutritious diet for the dependents.

Flow Chart

Rapid growth of population ---> Increase in demand ---> Price rise ---> Decrease in the purchasing power ---> More expenditure ---> Curtailment in demand to avoid loans, etc. -> -> Non-procurement of nutritious food ---> Decrease in health ---> Susceptibility to diseases increases ---> Decrease in productivity ---> Unemployment ---> Lower standard of living.

6. explains to the students the meaning, concept and conditions of optimum health:

   a) A balanced diet
   b) A sanitary water supply
   c) Protected water supply
   d) Personal hygiene
   e) An adequate rest and recreation
   f) Periodical medical checkup
   g) Mental hygiene
   h) Screening of diseases

7. organizes lectures/seminars. Doctors and experts from the field can be invited to deliver lectures on the subjects.

8. inculcates the habit among the students of getting nutrition from locally and seasonally available cereals and fruits.

9. organizes trips to hospitals and clinics in which students can observe and gather information regarding health and nutrition.

The students can:

10. under the guidance of teacher prepare the list of local commodities of nutritious value and display them in the school.

11. conduct surveys by interviewing the parents of small families and large families regarding the food items provided for the family members. They can prepare separate lists of food items consumed by small families and large families. These lists may be compared and analysed in order to correlate the effects of population growth on the procurement of nutritious food.

12. prepare lists of persons suffering from different diseases caused by under and malnutrition; here the family status can also be studied.

13. draw pictures of articles and indicate the nutritious values available in them.

14. actively participate in the debate/seminars/essay competitions organized in the class on the following topics:

   - Relation between population growth and health
   - Importance of balanced diet
   - Factors causing diseases: (Hints):
     (a) Biological; (b) Nutrients; (c) Chemicals; (d) Physical; (e) Mechanical; (h) Environmental; (g) Social; (h) Economic; (i) Psychological; (j) Cultural; (k) Human behaviour; (l) Genetic.

15. inculcate in themselves the habit of keeping the surroundings of the school clean leading to healthy habits. They can also organize mass cleanliness in the vicinities and educate the community regarding healthy living.

16. organize Health Week or Health Fortnight in villages to educate the community regarding the value and importance of health. They can also persuade the residents for periodical medical checkup of their children, at least once every quarter.

17. highlight the various health problems caused by overpopulation and incapability of providing nutritious food for the dependents due to limited income and resources by organizing cultural programmes, one act plays and puppet shows. They can also try to remove superstitions regarding diseases. In this regard the residents can also be persuaded to take advantages of health amenities and medical care provided by the Government.

18. collect data regarding per capita consumption of food and calories in developed and developing countries and can critically analyse the position of India in comparison with those countries.

19. draw graphs and charts of data thus collected.

20. collect and draw pictures depicting miserable health condition of the children of labourers, low income group population and slum area dwellers. These pictures can be displayed in the schools.

D. EVALUATION

1. Name the different ingredients of nutritions.

2. Fill in the blanks from the alternatives given in the brackets:

   a) _____ is mainly responsible for the development of organism. (Carbohydrate/protein/fat)

   b) _____ disease is caused by the deficiency of Vitamin A. (Skin/eye/scurvy)

   c) _____ is essential for proper nutrition of living organism. (Full diet/balanced diet/non-vegetarian diet)

   d) There is ____ relation between the population growth and availability of food. (Direct/indirect/no)

3. In column A, nutrition deficiencies are given and in column B diseases caused by such deficiency are given, but not in order. Please match column B according to column A:

Column A	Column B
a) Fat	a) Loss in weight
b) Protein	b) Eczema
c) Carbohydrate	c) Ricket
d) Vitamin C	d) Blindness
e) Vitamin D	e) Scurvy
f) Vitamin B12	f) Inflamation on face
g) Vitamin A	g) Jaundice

4. Some statements are given below. Please tick ( ) if right and cross (x) if wrong:

   a) Nine hundred calories are required for the 14-16 years of age group. ( )

   b) The food items of a larger family do not contain nutritious values. ( )

   c) There is no adverse effect of malnutrition on the healthy persons. ( )

   d) It is essential that vitamins and minerals should remain in adequate quantity, in food for development of organisms. ( )

   e) Unhealthy mothers cannot give birth to healthy children. ( )

   f) Population growth causes absence of nutritious food. ( )

5. Prepare a menu of daily diet of a family having six children with monthly income of Rs. 400/- per month. Suggest food items which are available locally and seasonally, and having nutritious value.

6. Write short notes on:

   a) Undernutrition and malnutrition
   b) Optimum health
   c) Population growth and health
   d) Ingredients of health
   e) Effects of excess accumulation and deficiency of nutrients in body, on health.
   f) Immunity.

7. Categorize the following nutrients according to their work in body:

a) Energy producer
b) Development
c) Regulators

Nutrients:

i) Carbohydrate
ii) Protein
iii) Fat
iv) Mineral salt
v) Vitamins
vi) Water

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